

**Quality Assurance Office**  
**RCRA**  
**Superfund**  
**Water**

# **Low-Flow Purging and Sampling**

## **An Alternative to Conventional Well Purging**

# Low-Flow Purging and Sampling Presentation

- The discussion in this presentation is based on recent research results and is subject to revision as more scientifically defensible findings on the low-flow method and on contaminant transport and fate during ground water purging and sampling become available.
- This presentation does not constitute endorsement or recommendations for use of the method without a program hydrogeologist first being consulted prior to use for case-by-case determination on effective use of the method for your application.

# **Items to be covered:**

- **Goal of ground water sampling**
- **Background and description of low-flow purging and sampling**
- **Difference between low-flow and conventional sampling**
- **Benefits derived from using low-flow methods**
- **Pointers for effectively applying the low-flow method**

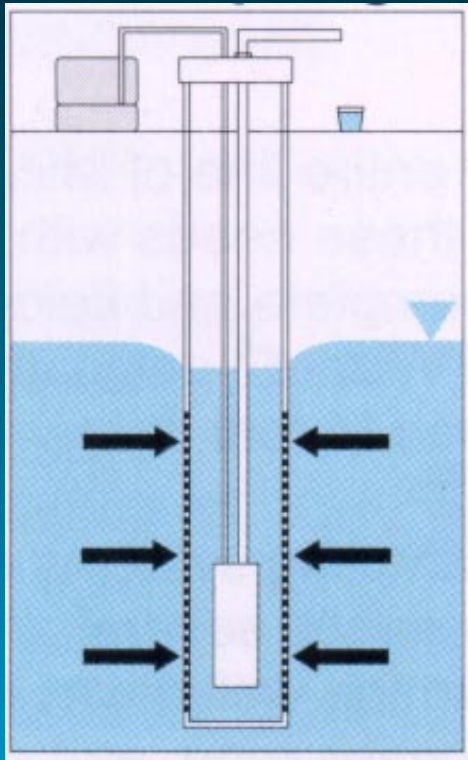
# **Goal of Ground Water Sampling**

- **Obtain water samples that are representative of the geochemical conditions in the aquifer.**

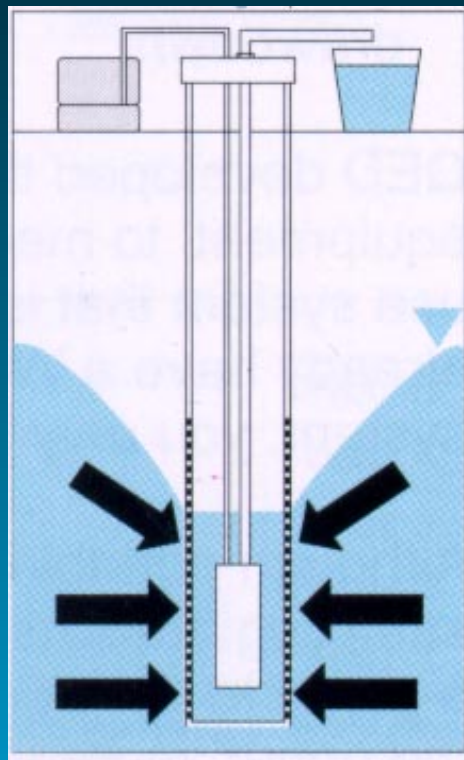
# Why Purge?

- Standing water in a well may not represent ground water quality in the hydrogeologic formation of interest.
- Ground water above the screened section remains isolated and stagnant.
- "Stagnant" water should be removed to avoid mixing between stagnant water and formation water.

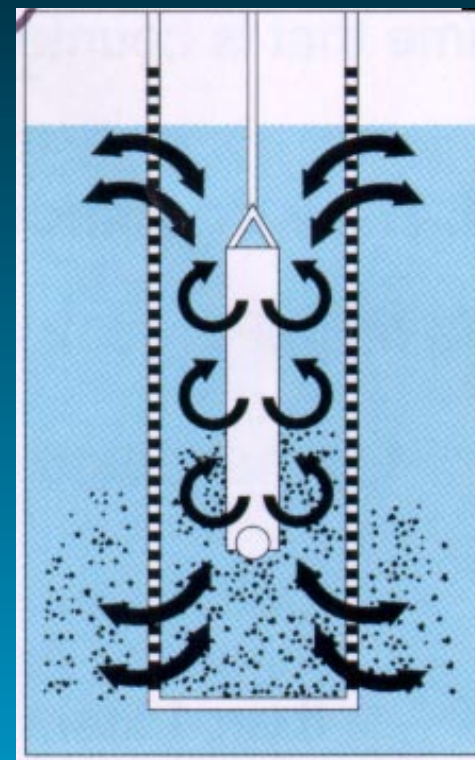
# Different Sampling Techniques



Low Flow minimizes drawdown, turbidity and purge volume.



High Flow pumping increases drawdown, turbidity and purge volume.



Bailer movement surges and mixes well, increases turbidity.

Figures courtesy of QED, Ground Water Specialist, for illustrative purposes only.

# What is low-flow purging and sampling?

- The method was developed in response to problems associated with turbid samples (i.e. metals contamination);
- Water is removed from a localized area around the well screen;
- Lower pumping rates generally 0.3 - 0.5 liters/minute are used to purge and sample wells;

# What is low-flow purging and sampling?

- The lower pumping rate mimics the natural flow in the formation, contributing to the production of low turbidity samples.
- Sample handling and sampling artifacts are reduced resulting in the production of more representative samples.



# Differences between low-flow and conventional purging methods

- Purging a specified number of well casing volumes is not required when using the low-flow method;
- Pumping rates used during low flow sampling are lower than those used for traditional purging, typically 0.3 to 0.5 liters/min (dependent on hydrogeology);
- Results from low flow sampling reflect the flow-weighted average concentration from a localized area around the well screen.

# **How is the low-flow method applied?**

- 1. The method is used in formations with medium to high hydraulic conductivity.**
- 2. Dedicated or portable pumps may be used. The pump intake is set within the contaminated zone within the screened interval.**

# **How is the low-flow method applied? (cont.)**

- 3. Purging and sampling are performed with as least disturbance on the well as is practicable and possible. Rates used for purging and sampling are typically 100-500 ml/min depending on site specific hydrogeology.**

**Close monitoring of the water level in the well is performed during purging to ensure that little or no drawdown or mixing of stagnant and formation water occurs.**

# **How is the low-flow method applied? (cont.)**

- 4. A multi-probe in line measurement device is used to monitor the stabilization of physical parameters. Dissolved oxygen and turbidity are usually the last to stabilize and are especially important.**

# How is the low-flow method applied? (cont.)

4. Other parameters monitored may include: specific conductance, pH, temperature, and oxidation-reduction potential.

**Stabilization:**

pH  $\pm 0.1$ ;  $\pm 3\%$  conductivity;  $\pm 10$  mV redox; and  $\pm 10\%$  for turbidity and dissolved oxygen

# **How is the low-flow method applied? (cont.)**

- 5. Samples are obtained from the pump discharge using the same or lower flow rate as purging.**

# Why use low-flow methods?

- Improves the quality of samples as mixing, turbidity, stripping, and dilution effects are minimized; more reproducible, representative samples are obtained;
- Potential reduction of purge water volume (i.e. reduce cost for handling and disposal).

# **Other benefits of low-flow methods:**

- **The need to filter samples is eliminated when the method is properly applied.**
- **Systematic errors associated with excess turbidity are reduced.**



# **Effective use of low-flow methods:**

- **The pump intake is placed within the contaminated zone within the screened interval;**
- **Information on well construction, borehole lithology, and depth to screened interval(s) should be available and accurate;**

# Effective use of the low-flow method

- Recharge to the lithologic/screened interval being sampled must be equal to or greater than rate of removal.
- Pumps used for purging and sampling should be compatible with the contaminant to be sampled and capable of extracting water from the desired depth without altering its chemical properties.

# Conclusion

- The low-flow method may be a viable alternative to conventional purging methods at sites where high sample turbidity and/or high purge water volumes are problems.
- A program hydrogeologist should be consulted prior to using the low-flow method to ensure its proper application.

# Regional Hydrogeologists

- **Ground Water Office**
  - Wendy Melgin, (415) 744-1831
- **Office of Underground Storage Tanks**
  - Matthew Small, (415) 744-2078
- **Office of RCRA Corrective Action Section**
  - Katherine Baylor, (415) 744-2028
- **Quality Assurance Office**
  - Richard Freitas, (415) 744-2315
  - Roseanne Sakamoto, (415) 744-1535
- **Superfund**
  - Herb Levine (415) 744-2312